COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
Street address: 1111 E. Main Street, Suite 1400, Richmond, Virginia 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218
www.deq.virginia.gov

Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

MEMORANDUM

TO: State Water Control Board Members

FROM: Jutta Schneider Jutta Schneider
Director, Water Planning Division

DATE: February 26, 2020

RE: Approval of two TMDL reports and amendment of the Water Quality Management Planning regulation to include the corresponding TMDL wasteload allocations.

Executive Summary

Staff will ask the Board to approve portions of two TMDL reports and adopt the corresponding amendments to Virginia's Water Quality Management Planning regulation. As of July 1, 2014, TMDL waste load allocations receive State Water Control Board approval prior to EPA approval due to amendments outlined in §2.2-4006.A.14 of the Code of Virginia. The TMDL reports have been reviewed by EPA for required TMDL elements; however, they remain in draft form until State Water Control Board approval.

I. Background

The Clean Water Act ("CWA") and the U.S. EPA Water Quality Management and Planning Regulation (40 CFR §130) require states to identify waters that are in violation of water quality standards and to place these waters on the state's 303(d) List of Impaired Waters. Also, the CWA and EPA's enabling regulation require that a TMDL be developed for those waters identified as impaired. In addition, the Code of Virginia, §62.1-44.19:7.C requires the State Water Control Board ("the Board") to develop TMDLs for impaired waters. A TMDL is a determination of the amount of a specific pollutant that a water body is capable of receiving without violating water quality standards for that pollutant. TMDLs are required to identify all sources of the pollutant and calculate the pollutant loads from each source that are necessary for the attainment of water quality standards.

Every TMDL consists of three basic components. They are the point source component called the wasteload allocation ("WLA"), the nonpoint source component called the load allocation ("LA"), and the margin of safety component ("MOS"). The TMDL is equal to the sum of these three components.

The U.S. EPA's Water Quality Management and Planning Regulation 40 CFR §130.7(d) (2) directs the states to incorporate TMDLs in the state's Water Quality Management Plan. Also, U.S. EPA's Water Quality Management and Planning Regulation 40 CFR§122.44(d) (1) (vii) (B) requires that new or reissued VPDES permits be consistent with the TMDL WLA. This means that the WLA component of the TMDL will be implemented through the requirements specified in the VPDES permits, for example through numeric water quality based effluent limitations or in certain cases best management practices ("BMPs"). Virginia implements the LA component using existing voluntary, incentive and regulatory programs such as the Virginia Agricultural Cost-Share Program and Federal Section 319(h) TMDL implementation funding. Specific management actions addressing the LA component are compiled in a TMDL implementation plan ("TMDL IP").

II. Proposed Actions

Staff will propose the following Board actions:

Approval of two TMDL reports (Attachment I), Amendment of Water Quality Management Planning regulation to incorporate eleven new WLAs (Attachment II)

1. The report titled, *"A TMDL and Watershed Management Plan to address Sediment in North Fork Catoctin Creek Located in Loudoun County, Virginia"* proposes sediment reductions for the North Fork Catoctin Creek watershed and provides a new sediment waste load allocations of 99.1 tons/year.
2. The report titled, *"Benthic TMDL Development for the North Fork Rivanna River Watershed and Tributaries Located in Albemarle, Greene, and Orange Counties"* proposes sediment reductions for the Blue Run, Marsh Run, Preddy Creek, Preddy Creek North Branch, Quarter Creek, Standardsville Run, Swift Run, and unnamed Tributary to Flat Branch watersheds and provides new sediment waste load allocations of 20,750 lbs/year, 5,210 lbs/year, 105,600 lbs/year, 47,940 lbs/year, 11,020 lbs/year, 6,105 lbs/year, 89,130 lbs/year, and 27,890 lbs/year. The report also proposes total phosphorus reductions for the Blue Run and Standardsville Run watersheds and provides new total phosphorus waste load allocations of 21.8 lbs/year and 4.6 lbs/year.

The specific portions of the TMDL report to be approved include the TMDL itself and all the TMDL allocation components, the pollutant reduction scenarios, implementation strategies, reasonable assurance that the TMDL can be implemented, and a summary of the public participation process. These portions are included in Attachment I.

The process for amending the Water Quality Management Planning regulation is specified in §2.2-4006A.14 and §2.2-4006B of the Code of Virginia. The amendments consist of adding eleven new WLAs that are included in the TMDL reports reviewed by EPA. Staff will therefore propose that the Board, in accordance with §2.2-4006A.14 and §2.2-4006B of the Code of Virginia, adopt the amendments to the Water Quality Management Planning regulation (9 VAC 25-720) as provided in Attachment II. The associated Virginia Regulatory Town Hall document is included as Attachment III.

III. Public Participation

The TMDL reports listed in Attachment I were developed in accordance with Federal Regulations (40 CFR §130.7). The TMDL reports were subject to the public participation process contained in §2.2-4006.A.14 of the Code of Virginia and DEQ's "Public Participation Procedures for Water Quality Management Planning" that the Board approved in September 2014. Written comments provided by stakeholders as well as the Commonwealth's responses are submitted to EPA together with the TMDL report. TMDL reports are also made available to the public on DEQ's web site under http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL/TMDLDevelopment/DraftTMDLReports.aspx.

The proposed final amendments to the Water Quality Management Planning regulation are exempt from the provisions of Article II of the Administrative Process Act. The TMDL WLAs listed in Attachment II were published in the Virginia Register (Volume 36, Issue 11) on January 20, 2020, with a public comment period ending on February 19, 2020. Staff received no comments.

IV. Presenter Contact Information:

Wasteload Allocation Changes to the Water Quality Management Planning Regulation

Contact: Kelly Meadows, Watershed Programs Manager
Phone Number: (804) 698-4291
E-mail: Kelly.Meadows@DEQ.Virginia.gov

V. Attachments

- **Attachment I** – Portions of two TMDL reports (with eleven new TMDL waste load allocations) for approval by the Board
- **Attachment II** – Amended Water Quality Management Planning regulation proposed for Board adoption
- **Attachment III** – Virginia Regulatory Town Hall – Exempt Action Final Regulation

This page is intentionally left blank

Attachment I – Portions of two TMDL reports (with eleven new wasteload allocations) for approval by the Board

Affected Waterbodies and Localities for the eleven new TMDL waste load allocations:
Potomac-Shenandoah River Basin (9VAC25-720-50.A)

1. *"A TMDL and Watershed Management Plan to address Sediment in North Fork Catoctin Creek Located in Loudoun County, Virginia"*
    - The North Fork Catoctin Creek TMDL, located in Loudoun County, proposes sediment reductions for the North Fork Catoctin Creek watershed and provides a new sediment waste load allocations of 99.1 tons/year.

James River Basin (9VAC25-720-60.A):

2. *"Benthic TMDL Development for the North Fork Rivanna River Watershed and Tributaries Located in Albemarle, Greene, and Orange Counties"*
    - The North Fork Rivanna River and Tributaries TMDL, located in Albemarle, Greene, and Orange counties, proposes sediment reductions for the Blue Run, Marsh Run, Preddy Creek, Preddy Creek North Branch, Quarter Creek, Standardsville Run, Swift Run, and unnamed Tributary to Flat Branch watersheds and provides new sediment waste load allocations of 20,750 lbs/year, 5,210 lbs/year, 105,600 lbs/year, 47,940 lbs/year, 11,020 lbs/year, 6,105 lbs/year, 89,130 lbs/year, and 27,890 lbs/year.
    - The North Fork Rivanna River and Tributaries TMDL, located in Albemarle, Greene, and Orange counties, proposes total phosphorus reductions for the Blue Run and Standardsville Run watersheds and provides new total phosphorus waste load allocations of 21.8 lbs/year and 4.6 lbs/year.

A TMDL and Watershed Management Plan to address Sediment in North Fork Catoctin Creek Located in Loudoun County, Virginia

Submitted by:

Virginia Department of Environmental Quality

Prepared by:

Department of Biological Systems Engineering, Virginia Tech

COLLEGE OF AGRICULTURE AND LIFE SCIENCES
BIOLOGICAL SYSTEMS
ENGINEERING
VIRGINIA TECH

October 2019

VT-BSE Document No. 2018-0004

Project Personnel

Virginia Tech, Department of Biological Systems Engineering

Karen Kline, Senior Research Scientist
Emily Smith-McKenna, Research Scientist
Megan Paul, Undergraduate Research Assistant
Brian Benham, Professor and Extension Specialist: Project Director
Gene Yagow, former Senior Research Scientist

Virginia Department of Environmental Quality (DEQ)

Sarah Sivers, Water Quality Planning Team Lead, Northern Regional Office
David Evans, Nonpoint Source Coordinator, Northern Regional Office
Brett Stern, Biologist, Northern Regional Office
Bryant Thomas, Water Permit & Planning Manager, Northern Regional Office

For additional information, please contact:
Virginia Department of Environmental Quality

Northern Regional Office, Woodbridge: Sarah Sivers, (703) 583-3898

EXECUTIVE SUMMARY

Applicable Water Quality Standards

Section 303 (d) of the Clean Water Act (CWA) and the United States Environmental Protection Agency's Water Quality Planning and Management Regulations require states to develop total maximum daily loads (TMDLs) for waterbodies that exceed water quality standards (WQS). A TMDL represents the total pollutant loading that a waterbody can receive without exceeding the WQS. The Virginia Department of Environmental Quality (DEQ) specifies the following benthic standard for aquatic life designated uses in surface waters:

- **Designation of Uses (9 VAC 25-260-10)** "A. All state waters are designated for the following uses: recreational uses (e.g. swimming and boating); the propagation and growth of a balanced indigenous population of aquatic life, including game fish, which might reasonably be expected to inhabit them; wildlife; and the production of edible and marketable natural resources (e.g., fish and shellfish)." SWCB, 2018.

- **General Criteria (9 VAC 25-260-20)** The general standard for a water body in Virginia is stated as follows: "A. State waters, including wetlands, shall be free from substances attributable to sewage, industrial waste, or other waste in concentrations, amounts, or combinations which contravene established standards or interfere directly or indirectly with designated uses of such water or which are inimical or harmful to human, animal, plant, or aquatic life.

  Specific substances to be controlled include, but are not limited to: floating debris, oil scum, and other floating materials; toxic substances (including those which bioaccumulate); substances that produce color, tastes, turbidity, odors, or settle to form sludge deposits; and substances which nourish undesirable or nuisance aquatic plant life. Effluents which tend to raise the temperature of the receiving water will also be controlled." SWCB, 2018.

Impairment Description

There are two stream segments in the North Fork Catoctin Creek watershed listed as impaired on Virginia's 2018 Section 305(b)/303(d) Water Quality Assessment Integrated Report because Virginia's general standard is not met for the protection of aquatic life (Figure ES-1, Table ES-1). This report presents the development of a TMDL and implementation plan for the benthic impairment in the lower North Fork Catoctin Creek segment (VAN-A02R_NOC01A00). The benthic impairment in the upper North Fork Catoctin Creek segment (VAN-A02R_NOC03A02) is primarily due to low-flow conditions, a non-pollutant, which does not require a TMDL. Therefore, this report recommends the upper segment be re-classified as a Category 4C in future Water Quality Assessment Integrated Reports.

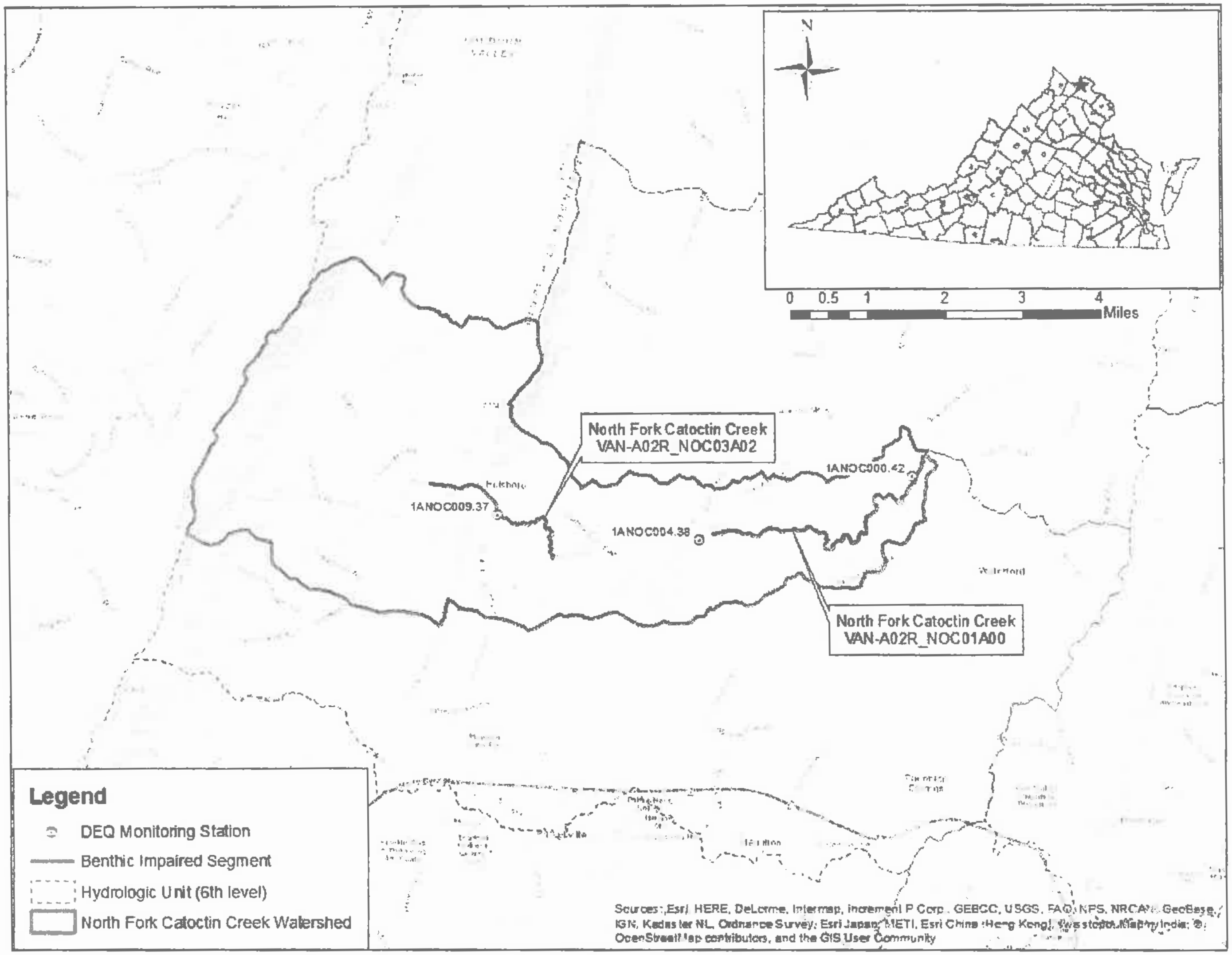


Figure ES-1. Impaired segments and DEQ monitoring stations in the North Fork Catoctin Creek watershed.

Table ES-1. Summary of Stream Segments with a benthic impairment in North Fork Catoctin Creek watershed (based on the 2018 305(b)/303(d) Water Quality Assessment Integrated Report).

Impaired Stream Name	Cause Group Code	305(b)/303(d) Assessment Unit ID	Initial Listing Year	Listing Station	Impairment Size	County	Impairment Length Description
North Fork Catoctin Creek	A02R-02-BEN	VAN-A02R_NOC01A00	2008	1ANOC000.42	4.42 miles	Loudoun	Confluence with an unnamed tributary to North Fork Catoctin Creek, approximately 0.15 river miles downstream from the Route 287 bridge to the confluence with Catoctin Creek
North Fork Catoctin Creek	A02R-04-BEN	VAN-A02R_NOC03A02	2014	1ANOC009.37	2.54 miles	Loudoun	Confluence with an unnamed tributary to North Fork Catoctin Creek, approximately 0.75 river miles upstream from Route 719 near Hillsboro, and continues downstream 2.45 river miles to an unnamed impoundment

Description of the Study Area

The North Fork Catoctin Creek watershed is located in Loudoun County. The majority of the watershed (70%) is within the Northern Piedmont Ecoregion Level III which is a transitional region consisting of "low rounded hills, irregular plains, and open valleys and is underlain by metamorphic, igneous, and sedimentary rocks" (Woods, et al, 1999). The remaining 30% is in the Blue Ridge Mountains Ecoregion Level III, varying from narrow ridges to hilly plateaus, and underlain by metavolcanic, igneous, sedimentary, and metasedimentary rock (Woods, et al, 1999). Almost half of the watershed (49%) is forested land, 38% agricultural, and 12% residential. The distribution of land uses for the NF Catoctin Creek watershed is tabulated in Table ES-2. NF Catoctin Creek flows east and discharges into Catoctin Creek, which discharges into the Potomac River. The Potomac River flows into the Chesapeake Bay.

Table ES-2. Land use distribution within the North Fork Catoctin Creek watershed (VGIN, 2018).

Land Use	Area (acres)	% of Total
Cropland (low-till)	1,154.7	8
Pasture	2,141.9	14
Hay	2,423.8	16
Forest	7,252.0	49
Barren/Transitional	31.4	<1
Pervious Developed	1,679.1	11
Impervious Developed	84.8	<1
Water	71.2	<1
Total	14,838.9	

Stressor Identification Analysis

Potential stressors contributing to the benthic impairments in the North Fork Catoctin Creek were identified through a stressor analysis. The analysis for this watershed was conducted in 2015, which included stakeholder input and results were finalized in the North Fork Catoctin Creek Stressor Analysis Report dated September 15, 2015, and included in this report as Appendix B. The analysis concluded that the upper NF Catoctin Creek (VAN-A02R_NOC03A02) stream segment has a minor impairment to its aquatic life use primarily due to low-flow conditions. The upper NF Catoctin Creek may be affected by slightly elevated levels of nitrogen and phosphorus, but not sufficient to warrant a TMDL. It is recommended that this stream segment be re-classified as a Category 4C water in future Water Quality Assessment Integrated Reports, as the impairment is not caused by a pollutant, and, therefore, no TMDL is required.

The lower NF Catoctin Creek (VAN-A02R_NOC01A00) stream segment has a slightly more severe impairment to its aquatic life use that has been monitored over a longer period than the upstream site. In addition to stress brought on by extended no-flow conditions, the benthic community in the lower NF Catoctin Creek has been affected by other stressors over time, as shown by periodic low Virginia Stream Condition Index (VSCI) scores during other flow conditions than no-flow periods. Sediment is the most probable additional stressor in the lower NF Catoctin Creek, although nutrients and organic matter may be additional minor sources of stress on the benthic community. Therefore, a TMDL has been developed for sediment to address the aquatic life use impairment on the lower NF Catoctin Creek stream segment.

TMDL Technical Approach

The Generalized Watershed Loading Functions (GWLF) model was used to simulate sediment loads in the North Fork Catoctin Creek benthic-impaired watershed. The GWLF model uses weather, transport, and nutrient data, and erosion estimates derived from the Universal Soil Loss Equation. Model estimates and development incorporates a sediment source assessment in the watershed to determine sediment supply. GWLF is a continuous simulation model that uses daily time steps for weather data and water balance calculations. The GWLF model was run in metric units and converted to English units for this report.

Critical Conditions, Seasonality, and Margin of Safety

For the sediment TMDL in North Fork Catoctin Creek, a 21 year period of record (April 1997 through March 2018) was selected for the modeling period based on the availability of daily weather data and to represent typical weather patterns and seasonality. This variability helps represent critical conditions during low and high flow in the GWLF model. Seasonality was incorporated in the GWLF model through daily time steps of weather data and water balance calculations, and monthly-variable parameter inputs for evapotranspiration cover coefficients, daylight hours/day, and rainfall erosivity coefficients for user-specified growing season months. An explicit margin of safety of 10% was used in addressing the NF Catoctin Creek sediment impairment to account for uncertainty.

TMDL Endpoint

Water quality standards for sediment in Virginia have not yet been established, therefore an alternate method was used for establishing a reference endpoint that would represent a "non-impaired" condition. The procedure used for the North Fork Catoctin Creek sediment impairment to set the TMDL sediment endpoint load is a modification of the methodology used to address sediment impairments in Maryland's non-tidal watersheds (Maryland Department of the Environment [MDE], 2006, 2009), hereafter referred to as the "all-forest load multiplier" (AllForX) approach. This approach uses a selection of watersheds that attained healthy biological scores sampled from monitoring stations.

Sediment TMDL

The stressor analysis for lower North Fork Catoctin Creek (VAN-A02R_NOC01A00) stream segment revealed that sediment was the "most probable stressor", and served as the basis for TMDL development. The sediment TMDL uses the equation ES.1 to calculate the annual TMDL allocations, which are shown in Table ES-3 and the daily TMDL allocations shown in

Table ES-4. The waste load allocation (WLA) in the watershed is comprised of the sediment load from permitted sources and a Future Growth WLA calculated as 2% of the TMDL.

$$TMDL = WLA + LA + MOS \quad [ES.1]$$

Where:

WLA = waste load allocation (point source permitted contributions, including future growth);
LA = load allocation (nonpoint source contributions); and
MOS = margin of safety.

The Technical Advisory Committee (TAC) recommended sediment loads from future land use estimates, and not existing land uses, be considered in the development of the TMDL to account for increased sediment load from transitional (land under construction) and developed land uses. The TAC preferred this approach to provide more opportunity to implement urban best practices (such as stream restoration) to address nonpoint sources of sediment in light of their knowledge of the expectation for residential development to occur in the watershed. Additionally, this acknowledges their concerns of higher sedimentation rates during land disturbance.

Table ES-3. Annual Sediment TMDL Allocations (tons/yr) for North Fork Catoctin Creek.

Impairment	TMDL (tons/yr)	WLA (tons/yr)		LA (tons/yr)	MOS (tons/yr)
Cause Group Code A02R-02-BEN					
North Fork Catoctin Creek VAN-A02R_NOC01A00	2,936.6	99.1		2,543.8	293.7
		VAG406086	0.04		
		VAG406103	0.04		
		VAG406175	0.04		
		VAG406477	0.04		
		VAG406539	0.04		
		Construction	40.18		
		Future Growth WLA	58.73		

Table ES-4. Daily Sediment TMDL Allocations (tons/day) for North Fork Catoctin Creek.

Impairment	TMDL	WLA		LA	MOS
	(tons/day)				
Cause Group Code A02R-02-BEN					
North Fork Catoctin Creek VAN-A02R_NOC01A00	28.42	0.27		25.31	2.84
		VAG406086	0.0001		
		VAG406103	0.0001		
		VAG406175	0.0001		
		VAG406477	0.0001		
		VAG406539	0.0001		
		Construction	0.1101		
		Future Growth WLA	0.1609		

Sediment Allocation Scenarios

Forest land use loads and permitted WLAs were not subject to reductions. Areas of harvested forest are transient sources of sediment subject to existing regulations to preserve water quality. Based on input from the Virginia Department of Forestry, the BMPs applied to areas of harvested forest are exceeding these existing regulations. Therefore, the loads from harvested forest are included with the "Forest" land use and no additional reductions are needed.

Implicit in this watershed management plan is the need to avoid increased delivery from nonpoint sources of sediment that may develop over time because the North Fork Catoctin Creek watershed is experiencing residential growth and development. To account for this need, the TAC recommended the TMDL account for increased sediment load from transitional and developed land uses based upon expected future conditions. However, due to uncertainty inherent in predicting future growth, two distributions of the load allocation among the sources of sediment were developed, one based upon future land use and one on existing land use.

The LA distribution scenario based upon the future conditions is identified as "Strategy 1" (Table ES-5), which assumes an anticipated 138% increase in development above that which is currently existing within the watershed. This strategy focuses on increased sediment loads from developed and transitional land uses, as well as increased channel erosion, that will accompany projected residential and urban build-out in the watershed. The future growth is anticipated to transition lands equally from both existing agricultural land uses (row crop, pasture, and hay) and existing forest land use. For Strategy 1, the overall reduction in estimated future sediment loads needed to achieve the TMDL's load allocation is 30.3%.

The second LA distribution scenario, identified as "Strategy 2" (*Includes adjustment for existing BMPs

Table ES-6), focuses on existing conditions and sediment loads from agricultural land use types. Therefore, Strategy 2 focuses solely on additional best management practices for pasture land use type to meet the sediment load allocation as an alternative in case the anticipated growth does not occur, or occurs more slowly, than projected. If future growth does not occur, Strategy 2 will require a 33.4% overall sediment reduction.

Sedimentation rates are higher from agricultural lands than developed lands, resulting in the percent reduction associated with Strategy 1 (future condition) being lower than Strategy 2 (the existing condition). Consideration of these two extreme scenarios provides protection for North Fork Catoctin Creek for both existing and future conditions.

Table ES-5. North Fork Catoctin Creek sediment TMDL load allocation (LA), Strategy 1.

Land Use/Source Group	Future Land Area (acres)	Future Sediment Load (tons/yr)	Strategy 1	
			% Reduction	Load (tons/yr)
Row Crops	904.7	585.9	37.5%	366.2
Pasture/Hay	3,577.3	1,905.9*	27.4%	1384.6
Forest	6,013.3	178.5	0.0%	178.5
Developed, impervious	201.5	45.0	37.5%	28.1
Developed, pervious	3,996.1	514.3	37.5%	321.5
Transitional, non-regulated	52.9	373.4	37.5%	233.4
Channel Erosion		46.2	37.5%	28.9
Total Load		**3,649.2**		**2,541.1**
LA = (tons/yr)		**2,543.8**		
Needed Reduction = (tons/yr)		1,105.4		
% Reduction Needed = (%)		30.3%		

*Includes adjustment for existing BMPs

Table ES-6. North Fork Catoctin Creek sediment TMDL load allocation (LA), Strategy 2.

Land Use/Source Group	Existing Land Area (acres)	Existing Sediment Load (tons/yr)	Strategy 2 % Reduction	Strategy 2 Load (tons/yr)
Row Crops	1,154.7	747.6	40.1%	447.8
Pasture/Hay	4,565.7	2,517.5*	32.7%	1693.3
Forest	7,252.0	215.2	0.0%	215.2
Developed, impervious	84.8	18.9	33.3%	12.6
Developed, pervious	1,679.1	216.1	33.3%	144.1
Transitional, non-regulated	9.6	68.2	74.0%	17.7
Channel Erosion		36.8	70.5%	10.9
Total Load		**3,820.3**		**2,541.6**
LA = (tons/yr)		**2,543.8**		
Needed Reduction = (tons/yr)		1,276.5		
% Reduction Needed = (%)		33.4%		

*Includes adjustment for existing BMPs

Recommended Management Practices

A broad suite of agricultural and residential and urban practices are recommended to reduce sources of sediment and restore the water quality of the North Fork Catoctin Creek watershed. These measures also address concerns voiced by the TAC that practices should anticipate increased sediment load from transitional and developed land uses based upon expected future conditions. In summary, all recommended management practices proposed by this plan (consisting of both Strategies 1 and 2) include:

- 4,512 additional feet of livestock exclusion fencing, with riparian buffers, at an estimated cost of $114,579.
- 3,156 acres of pasture and cropland stabilization and improvement measures, at an estimated cost of $631,615.
- 791 linear feet of streambank stabilization and channel restoration, at an estimated cost of $587,300.
- 871 acres treated of residential and urban practices such as erosion and sediment controls, bioretention, rain gardens and riparian buffers, at an estimated cost of $2,897,500.

- Recommendation to strength existing conservation easements to improve water quality protections and pursue new easements to increase percentage of land under easement in the watershed.

Measurable Goals and Milestones

The timeframe over which best practices that address nonpoint sources should be implemented to reach water quality goals is typically 10 or 15 years. The first period identified pertains to the time it will take to install all best practices identified by the plan, which is known as "full implementation." The second period typically discussed is the time to reach the water quality goal, resulting in a delisting of the impaired section of waterbody due to its water quality being restored.

For this plan, a 10 year horizon was agreed to by the TAC for full implementation of best practices. Within those 10 years, implementation will occur in two stages, identified as Stage 1 (years 1-10) and if needed, Stage 2 (years 6-10). The sediment reduction goals for Stage 1 are identified by the load allocation (LA) distribution scenario known as Strategy 1 (future condition), shown in Table ES-5. The second stage, Stage 2, will only be initiated if it is observed during implementation of the plan that projected future growth is either not occurring or occurring more slowly than anticipated. In that situation, in Year 6, efforts will shift to include implementation of best practices identified for Stage 2, in addition to those practices identified for Stage 1. Under Stage 2, additional agricultural management practices would be implemented to address the larger amount of agricultural lands in the watershed than assumed in the future growth condition (Strategy 1). In this case, the sediment reduction goals will change to the LA distribution scenario known as Strategy 2 (existing condition), and shown in Table ES-6.

TMDL Implementation and Reasonable Assurance

The goal of the TMDL program is to establish a three-step path that will lead to attainment of water quality standards. The first step in the process is to develop a TMDL that identifies the level of sediment reductions needed to attain water quality standards. This report represents the culmination of that effort for the lower North Fork Catoctin Creek benthic impairment (VAN-A02R_NOC01A00).

The second step was to develop a TMDL implementation plan. This report is an integrated watershed management plan which includes implementation practices to achieve attainment of the TMDL reduction goals. Watershed stakeholders provided input and participated in the development of the implementation plan, which was also supported by central and regional offices of DEQ and other cooperating agencies.

Once developed, DEQ intends to incorporate this watershed management plan (combined TMDL and Implementation Plan) into the appropriate Water Quality Management Plan (WQMP), in accordance with the Clean Water Act's Section 303(e). In response to a Memorandum of Understanding (MOU) between the United States Environmental Protection Agency (EPA) and DEQ, DEQ also submitted a draft Continuing Planning Process to EPA in which DEQ commits to regularly updating the WQMPs (40 CFR. 130.5). Thus, the WQMP will be, among other things, the repository for all TMDLs and TMDL implementation plans developed within a river basin.

The final step is to begin implementing recommendations outlined in the watershed management plan and to monitor stream water quality to determine if water quality standards are being attained. The purpose, location, parameters, frequency, and duration of the monitoring will be determined by the DEQ staff and local stakeholders. Whenever possible, the location of the follow-up monitoring station(s) will be the same as the listing station(s). At a minimum, the monitoring stations must be representative of the original impaired segments. The details of the follow-up monitoring will be outlined in the Annual Water Monitoring Plan prepared by the DEQ Northern Regional Office for NF Catoctin Creek. Other agency personnel, watershed stakeholders, etc. may provide input on the Annual Water Monitoring Plan.

Taken together, the follow-up monitoring, Water Quality Planning Regulations, and the Virginia Water Quality Monitoring, Information and Restoration Act (WQMIRA), public participation, and the Continuing Planning Process, comprise a reasonable assurance that the North Fork Catoctin Creek sediment TMDL will be implemented and water quality will be improved.

Public Participation

DEQ staff encouraged public participation during development of the effort to address a benthic impairment in the North Fork Creek Catoctin watershed. This effort began with conducting the stressor analysis and continued through development of the TMDL and Implementation Plan (summarized in one plan called the "TMDL/Watershed Management Plan") to receive input from stakeholders and to apprise the stakeholders of the progress made. There were a total of three public meetings and seven technical advisory committee (TAC) meetings over the course of conducting the stressor analysis and developing the TMDL/Watershed Management Plan. During the 30-day public comment period on the draft report, DEQ received 1 set of comments from a member of the Catoctin Creek Scenic River Advisory Committee. The comments and DEQ's response to comments are provided in Appendix G.

Benthic TMDL Development for the North Fork Rivanna River Watershed and Tributaries Located in Albemarle, Greene, and Orange Counties

Prepared by:
James Madison University
and
EEE Consulting, Inc.

Prepared for:
Virginia Department of Environmental Quality

April 2019

3e EEE Consulting, Inc.
Environmental, Engineering and Educational Solutions

JAMES MADISON UNIVERSITY

Acknowledgements

Project Personnel

James Madison University

Dr. Robert Brent, Associate Professor
Celeste Horton, Undergraduate Research Assistant
Christopher Williamson, Undergraduate Research Assistant

EEE Consulting, Inc.

Katie Shoemaker, PE, CFM, Environmental Engineer

Virginia Department of Environmental Quality (VADEQ)

Nesha McRae
Tara Wyrick
Sara Bottenfield

Technical Advisory Committee

Rachel Pence, Julia Ela, Lisa Wittenborn, and Robbi Savage – RCA
Bob Runkle and Greg Wichelns – Culpeper SWCD
Luke Longanecker – Thomas Jefferson SWCD
Jon Lipinski and Cory Kirkland – NRCS
John Murphy – Albemarle County
Jason Devillier – Charlottesville Albemarle Airport
Terry Beigie – Green County Record and citizen
Ashley Hall - Stantec representing VDOT
Patrick Montezuma and Barbara Rich – Twin Lakes HOA
Marilyn Smith, Martha Ledford, and Jim Hurley - Citizen

For additional information, please contact:

Virginia Department of Environmental Quality

Valley Regional Office, Harrisonburg: Nesha McRae, (540) 574-7850

1.0 EXECUTIVE SUMMARY

1.1. Background

The North Fork Rivanna River watershed is located in Albemarle, Greene, and Orange Counties, Virginia, and drains a predominantly rural watershed with some isolated developed areas. The North Fork Rivanna River flows south into the Rivanna River, which is part of the James River basin that ultimately flows into the Chesapeake Bay.

> Definition:
>
> Watershed – All of the land area that drains to a particular point or body of water.

The North Fork Rivanna River and several of its tributaries are listed as impaired on Virginia's 2016 Section 305(b)/303(d) Water Quality Assessment Integrated Report due to water quality violations of the general aquatic life (benthic) standard. The impaired segments addressed in this document are shown in **Table 1-1**. The watersheds of the impaired streams are show in **Figure 1-1**.

Table 1-1. Impaired segments addressed in this TMDL study.

TMDL Watershed	305(b) Segment ID	Cause Group Code 303(d) Impairment ID	Year Initially Listed
Blue Run	VAV-H27R_BLU01A04 (8.72 mi)	H27R-06-BEN	2012
Marsh Run	VAV-H27R_MAR01A10 (3.65 mi)	H27R-05-BEN	2010
Preddy Creek	VAV-H27R_PRD01A00 (7.48 mi)	H27R-08-BEN	2016
Preddy Creek North Branch	VAV-H27R_PRD02A06 (6.24 mi)	H27R-03-BEN	2010
Quarter Creek	VAV-H27R_QTR01A16 (1.58 mi)	H27R-10-BEN	2016
North Fork Rivanna River	VAV-H27R_RRN02A00 (3.82 mi) VAV-H27R_RRN03A10 (3.51 mi)	H27R-09-BEN	2016
Stanardsville Run	VAV-H27R_SDV01A14 (5.71 mi)	H27R-07-BEN	2014
Swift Run	VAV-H27R_SFR01A00 (1.91 mi)	H27R-02-BEN	2012
X-Trib to Flat Branch	VAV-H27R_FTB01A08 (2.03 mi)	H27R-01-BEN	2010

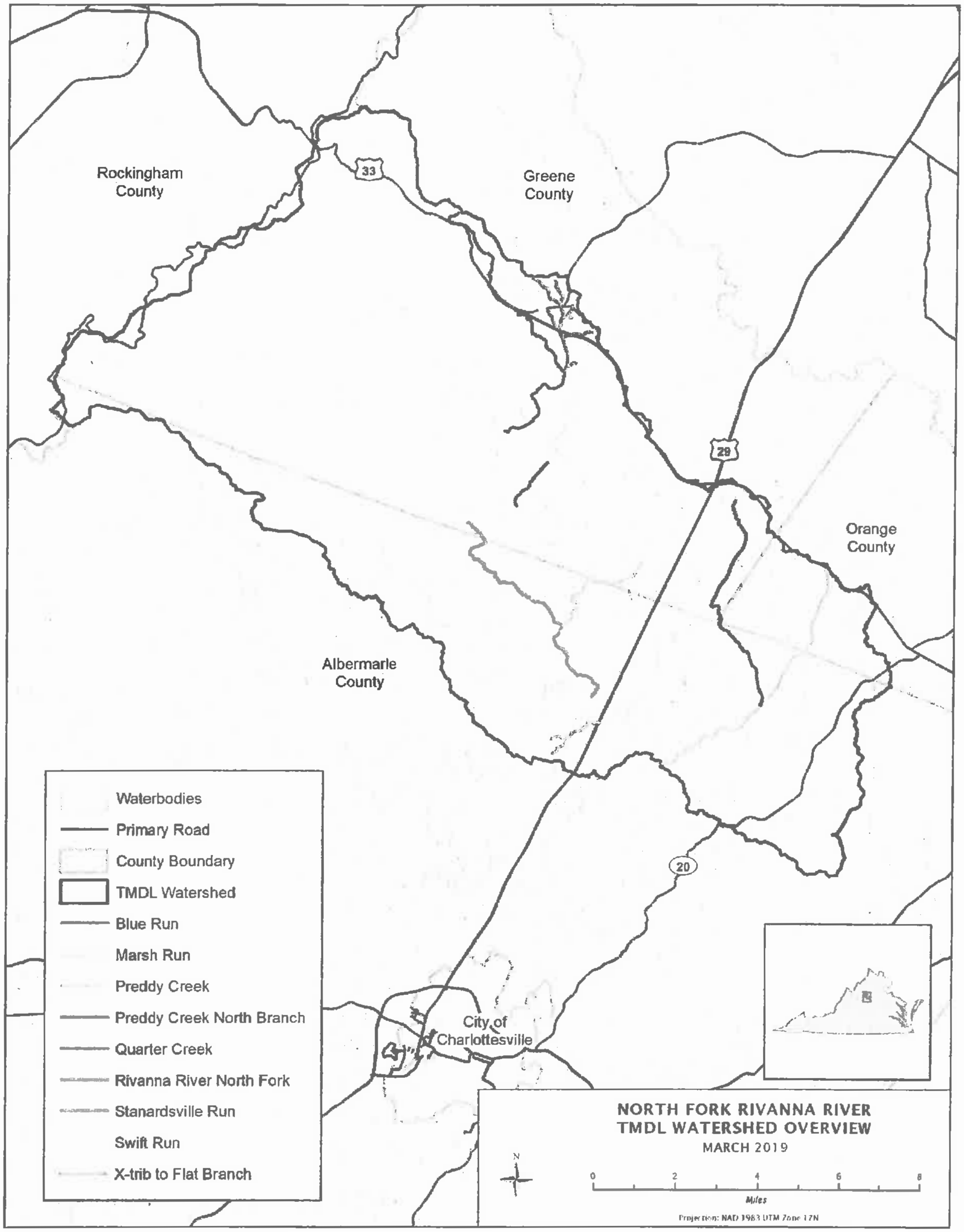


Figure 1-1. Location of the North Fork Rivanna River watershed and associated impairments.

1.2. The Problem

1.2.1. Impaired Aquatic Life

The Commonwealth of Virginia sets standards for all the waters in the state. One of those standards is the expectation that every stream will support a healthy and diverse community of bugs and fish (the aquatic life standard). The Virginia Department of Environmental Quality (VADEQ) determines whether this standard is met by measuring the diversity of benthic macroinvertebrates (bugs that live on the bottom of the stream). The health and diversity of these bugs are assessed on a scale from 0 to 100, with scores greater than 60 being acceptable. **Figure 1-2** shows the various monitoring stations throughout the watershed, color-coded by the average score at each site. Red and yellow icons indicate that the streams do not support a healthy and diverse community of bugs and fish. This shows that the various impaired streams in this study fail the aquatic life standard, and pollutants within the watershed need to be reduced.

A stressor identification analysis study was conducted in January 2019 to figure out the reason for the benthic impairments in the North Fork Rivanna River watershed. The study found that the main cause of the impairments was too much sediment. In two of the tributaries, Blue Run and Stanardsville Run, the cause of the impairment was too much sediment as well as too much phosphorus.

For the impairment on the North Fork Rivanna River itself, the stressor identification analysis identified two probable stressors or reasons for the impairment: sediment and the presence of the Advance Mills Dam just 50 m upstream from the monitoring station (**Appendix D**). In addition, other contributing factors, such as historic dams and sediment loads to the river may also be continuing to impact benthic life in the North Fork Rivanna River. Based on the combined factors of the highly localized nature of the marginal impairment, model results that show no need for mainstem sediment reductions, and additional sediment reductions that will come from implementation of upstream TMDLs, VADEQ has decided not to assign specific reductions to the mainstem North Fork Rivanna River at this time. Implementation of upstream reduction scenarios related to the other impairments in the watershed will only improve the water quality in the North Fork Rivanna River. In addition, VADEQ began biological monitoring at a new station farther away from the potential influence of the dam in fall of 2018. Monitoring will continue at the new station to help determine if the marginal impairment at the current station may in fact have been due to a combination of contributing factors, including the localized impact of the dam.

Figure 1-2. Stream health score summaries in the North Fork Rivanna River watershed.

1.2.2. Too Much Sediment

Excess sediment was identified as the primary stressor in all of the streams in the project area. When it rains, sediment is washed off of the land surface into nearby creeks and rivers. The amount of dirt that is washed off depends upon how much it rains and the type of land that the rain falls on. Some land types, like a freshly plowed farm field or a construction site, can yield a lot of sediment when it rains, while other land types, like forests and well-maintained pasture, yield only a little. When that dirt gets into nearby streams, it falls to the bottom as sediment and can smother certain bugs that live on the bottom of the stream, limiting the diversity of aquatic life.

1.2.3. Too Much Phosphorus

In addition to having too much sediment, Blue Run and Stanardsville Run have too much phosphorus. Phosphorus is a nutrient that helps plants grow. Non point sources of phosphorous include runoff of fertilizers and manures. Phosphorous can also reach our waterways through atmospheric deposition. Just as dirt can wash off of the land surface into nearby creeks, phosphorus contained in fertilizers or manures that are applied to lawns or farm fields can also wash off. Point sources of phosphorous include industrial and municipal waste water treatment facilities. In a stream, phosphorus makes algae grow, and that algae reduces oxygen levels in the water when it dies and decomposes. Excessive levels of algae in the water may produce large diurnal swings in both dissolved oxygen concentrations and pH. These large shifts can be harmful to aquatic life, thus limiting the diversity of bugs and fish that make up the aquatic community.

1.3. The Study

To study the problem of excess sediment and phosphorus in the North Fork Rivanna River watershed, a combination of monitoring and computer modeling was utilized. Monitoring was used to tell how much sediment and phosphorus are in the streams at any given time and how aquatic life conditions have changed over time. The computer model was used to estimate where the sediment and phosphorus are coming from and make predictions about how stream conditions would change if those sources were reduced.

Frequently Asked Question:

Why use a computer model?
Sampling and testing tells you a lot about the present and the past, but nothing about the future. A computer model is a tool that can help you make predictions about the future. This is necessary to figure out how much effort is needed to clean up a stream.

For this purpose, a computer model called the Generalized Watershed Loading Function model (or GWLF) was used. This model considers the slope, soils, land cover, erodibility, and runoff to estimate the amount of soil eroded in the watershed and deposited in the stream. The model was calibrated against real-world flow measurements taken from the stream in order to ensure that it is producing accurate results. The tested model was then used to estimate the sediment and phosphorus reductions that would be needed to completely restore a healthy aquatic life to the impaired streams in the watershed.

Definition:

TMDL – Total Maximum Daily Load. This is the amount of a pollutant that a stream can receive and still meet water quality standards. The term TMDL is also used more generally to describe the state's formal process for cleaning up polluted streams.

This report summarizes the study and sets goals for a clean-up plan. The study is called a Total Maximum Daily Load (TMDL) Study, because it determines the maximum amount of sediment and phosphorus that can get into a certain stream without harming the stream or the creatures living in it.

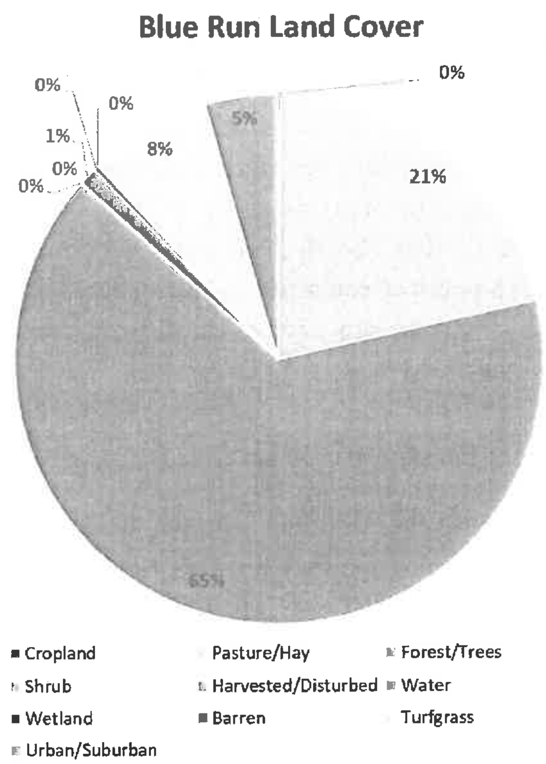
1.4. Current Conditions

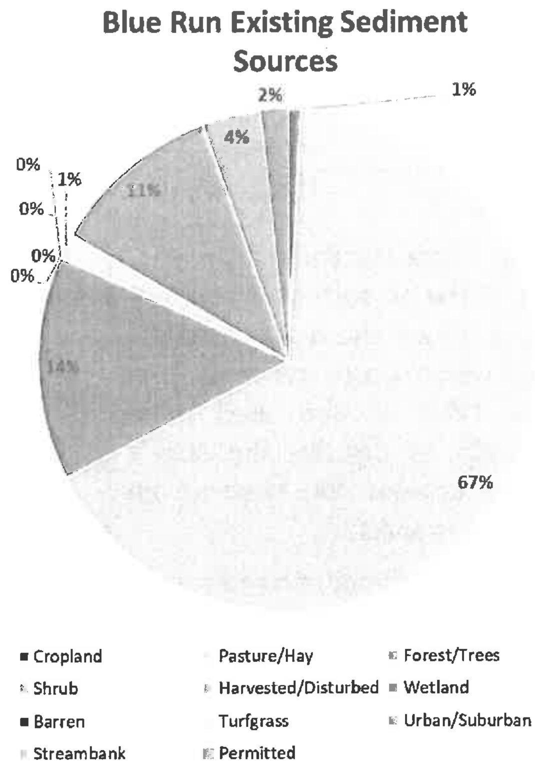
For this report, the Virginia Geographic Information Network (VGIN) 2016 land cover dataset was used to represent the current land use with minor modifications. The land cover distribution for each impaired watershed is shown in **Figure 1-3** through **Figure 1-11**. Many of the watersheds are largely forested with the majority of agricultural lands being in pasture or hay rather than cropland. The Stanardsville Run and Flat Branch tributary watersheds are the only two with greater than 20% combined urban/suburban land and turf grass, which are associated with residential and commercial land uses.

Definition:

Point Source – pollution that comes out of a pipe (like at a sewage treatment plant).
Non-point Source – pollution that does not come out of a pipe but comes generally from the landscape (usually as runoff).

This land cover dataset combined with an accounting of the permitted discharges represent the major pollutant sources in the watershed. The GWLF model was used to figure out where the sediment and phosphorus in the impaired watersheds were currently coming from. **Figure 1-3** through **Figure 1-11** show the distribution of sediment contributions from various sources in the watersheds, as well as phosphorus sources for Stanardsville Run and Blue Run, which were identified as having too much phosphorus in addition to excess sediment. The permitted sources include two Municipal Separate Storm Sewer System (MS4) entities (Albemarle County and the Virginia Department of Transportation), construction permits, water treatment plants, industrial stormwater permits, and other permitted point sources. In most of the watersheds, hay and pasture covers a greater extent than urban areas, and as such the majority of the sediment loads are derived from hay and pasture lands. In Stanardsville Run and the Flat Branch tributary watershed, the greater urban land cover is reflected in a higher urban sediment load, and significantly higher phosphorus load in Stanardsville Run. The Flat Branch tributary watershed is the only one with a significant permitted point-source load. The majority of this permitted load is due to the two MS4 areas, which are dominated by urban land uses.





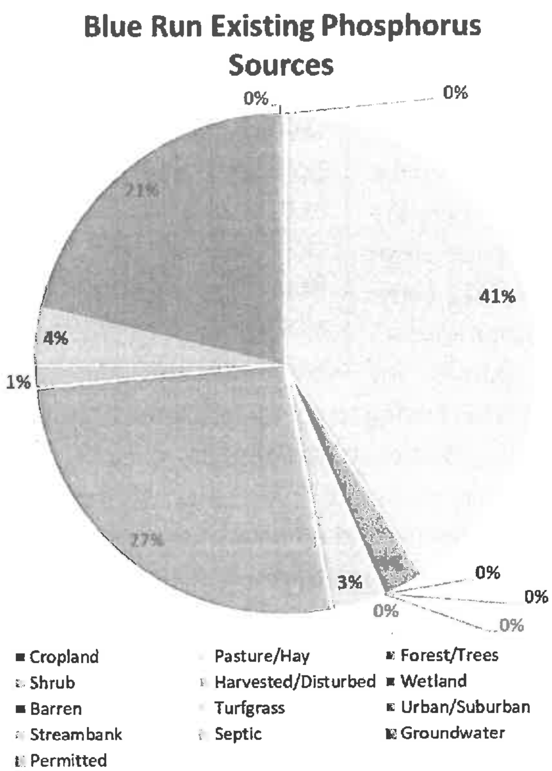


Figure 1-3. Land cover and existing source load distributions in the Blue Run watershed.

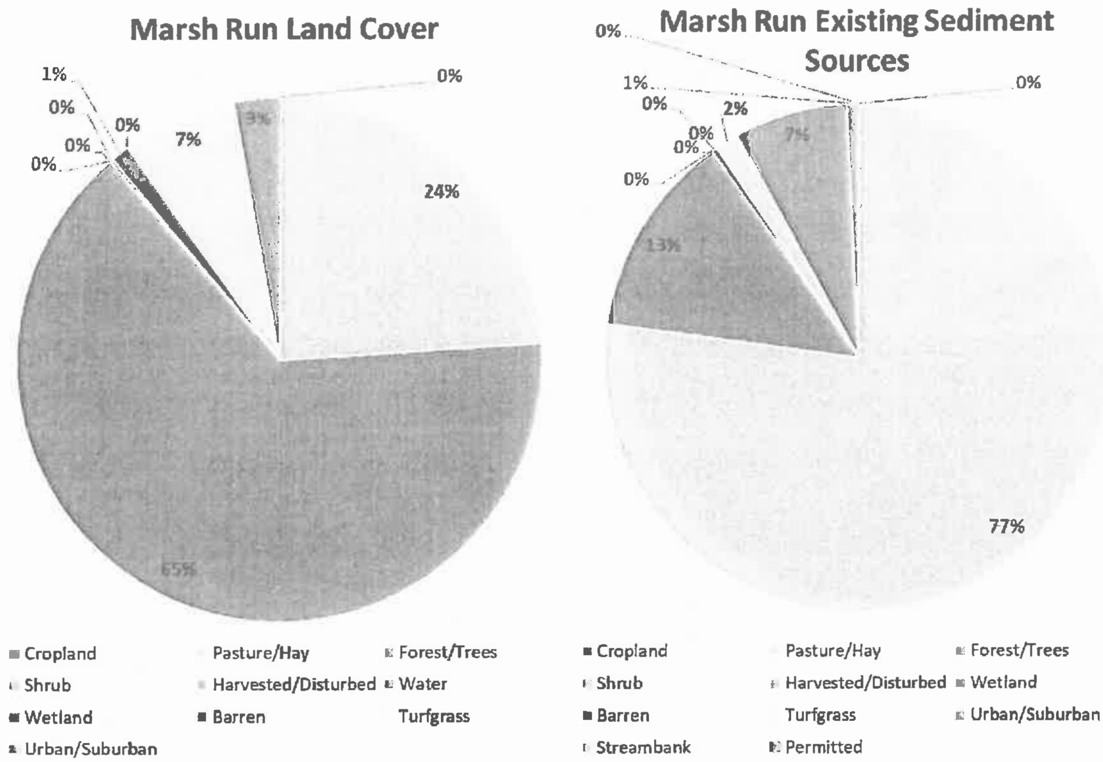


Figure 1-4. Land cover and existing source load distributions in the Marsh Run watershed.

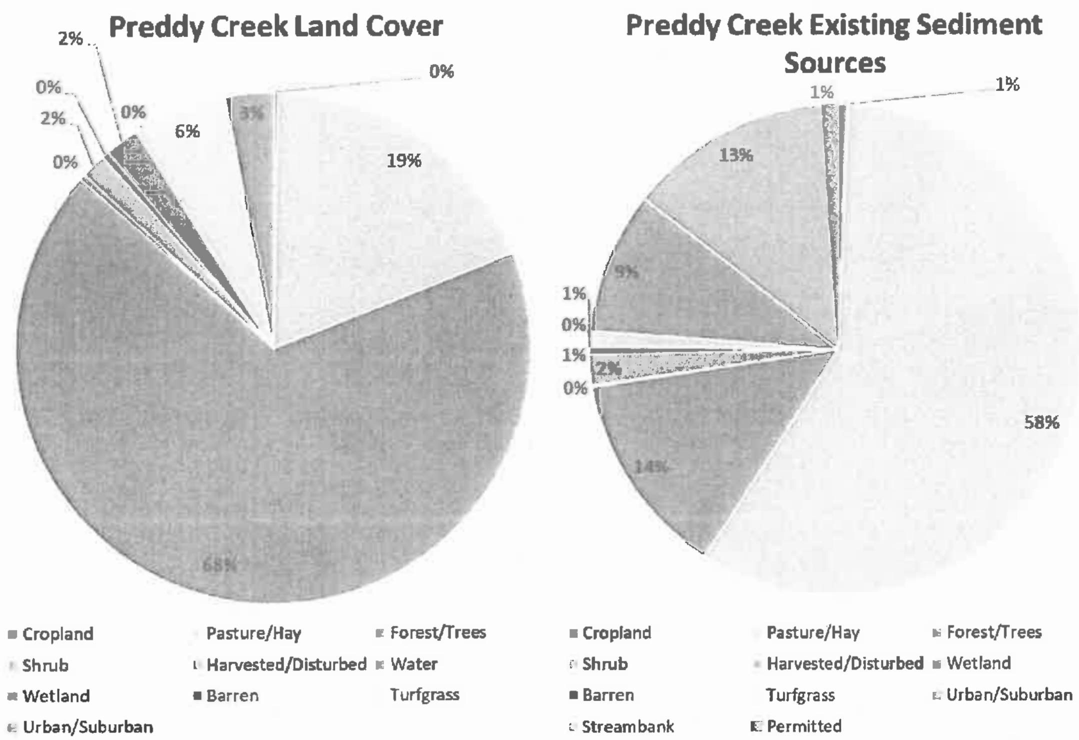


Figure 1-5. Land cover and existing source load distributions in the Preddy Creek watershed.

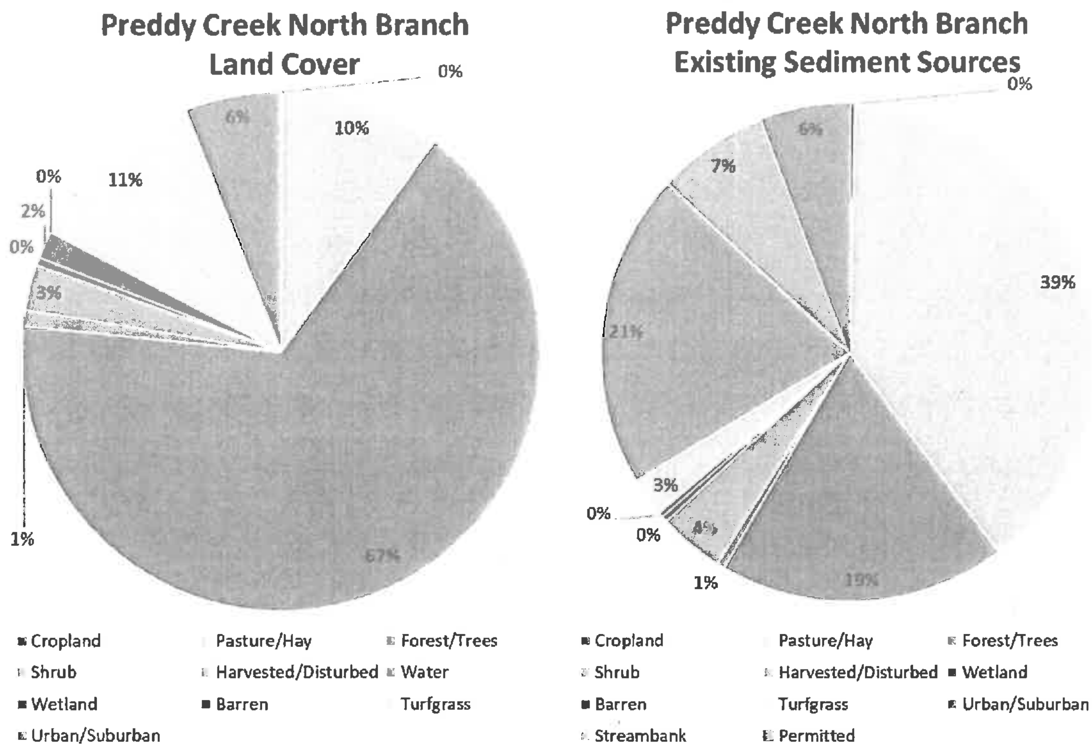


Figure 1-6. Land cover and existing source load distributions in the Preddy Creek North Branch watershed.

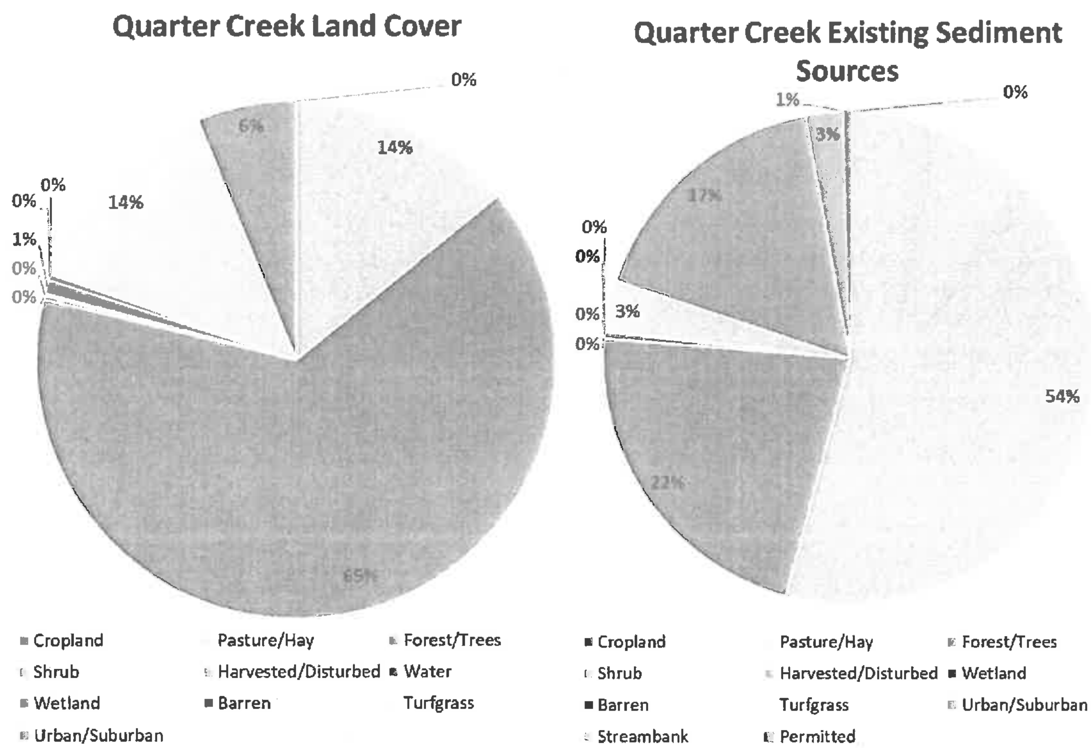


Figure 1-7. Land cover and existing source load distributions in the Quarter Creek watershed.

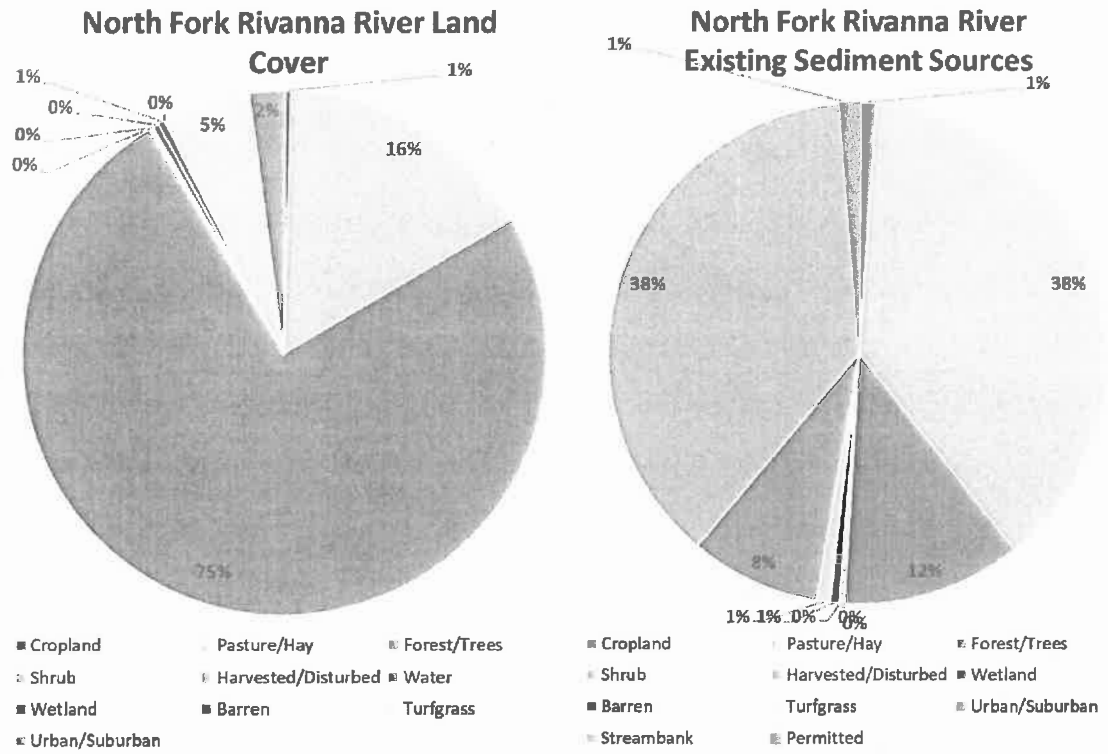


Figure 1-8. Land cover and existing source load distributions in the North Fork Rivanna River watershed.

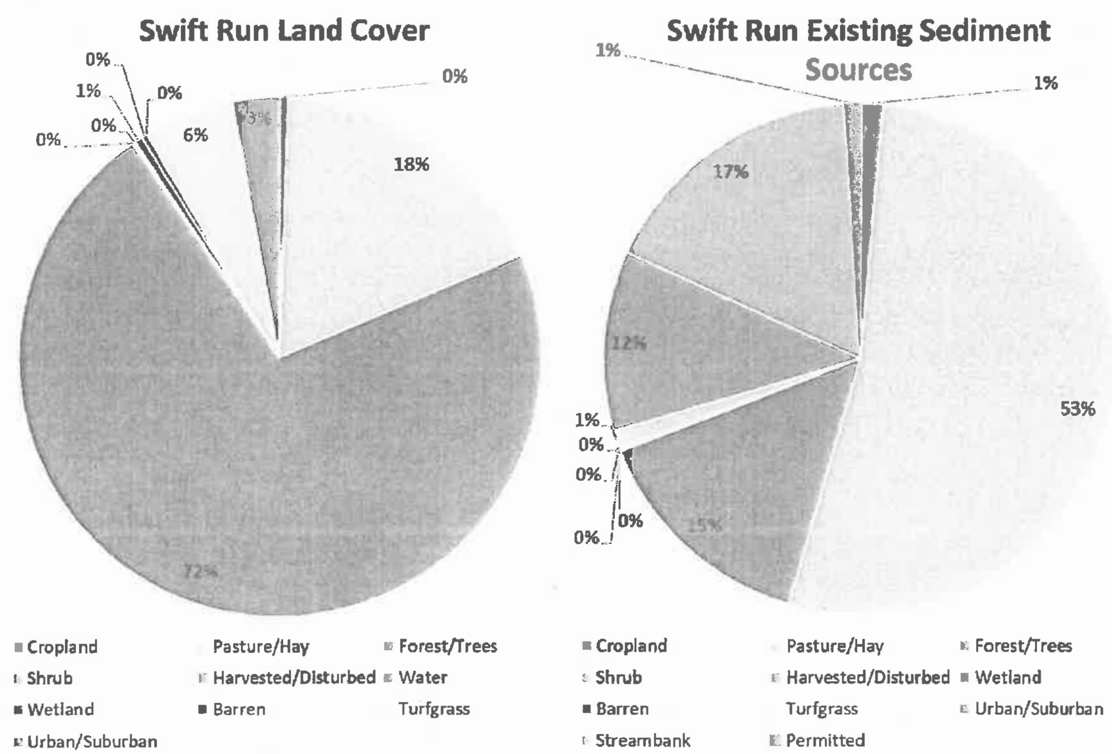


Figure 1-9. Land cover and existing source load distributions in the Swift Run watershed.

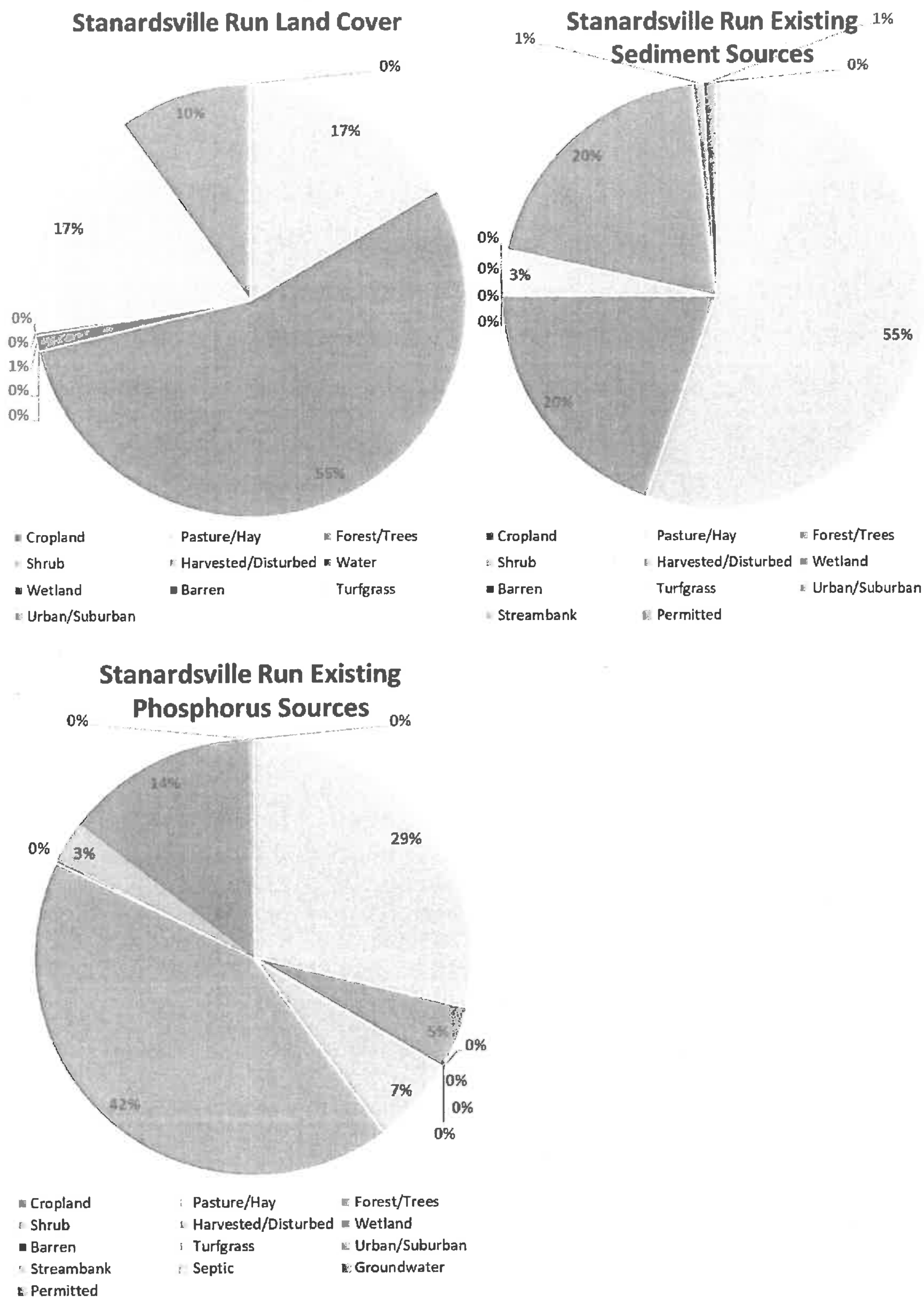


Figure 1-10. Land cover and existing source load distributions in the Stanardsville Run watershed.

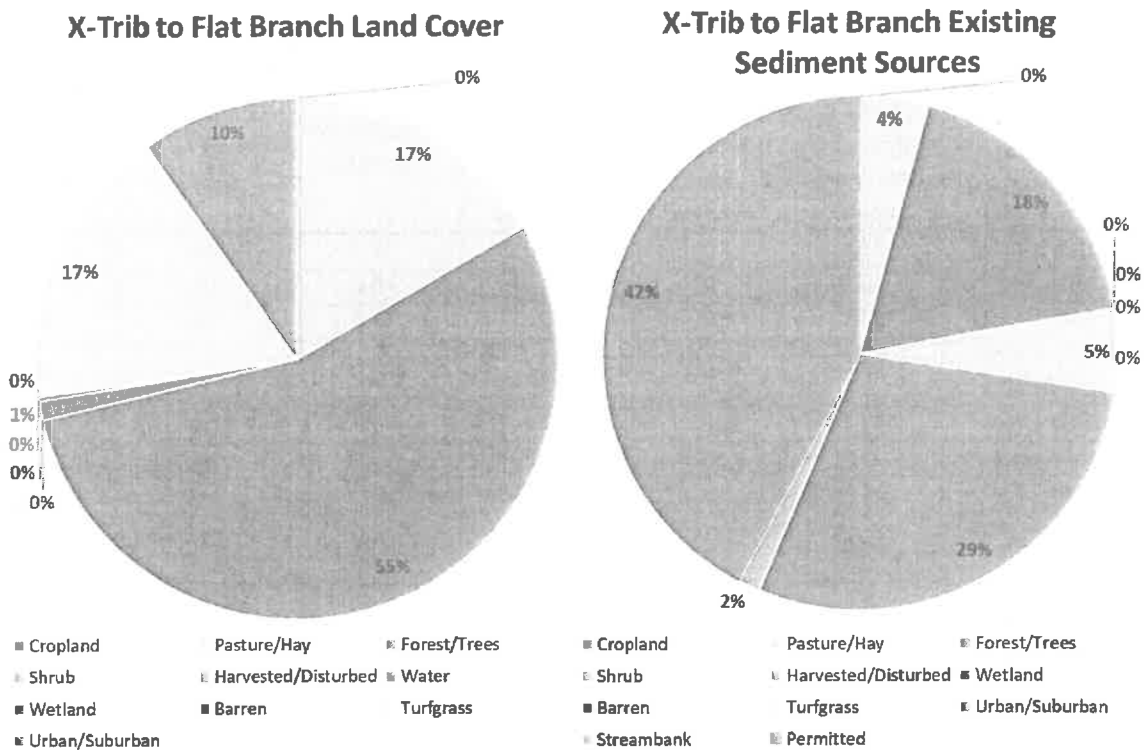


Figure 1-11. Land cover and existing source load distributions in the X-Trib to Flat Branch watershed.

1.5. Future Goals (the TMDL)

After figuring out where the sediment and phosphorus in the impaired streams are currently coming from, a computer model was used to figure out how much sediment and phosphorus loads need to be reduced to clean up each stream. The ultimate goal for these streams is to have sediment and phosphorus levels that allow for diverse and abundant aquatic life. The reductions in sediment and phosphorus needed to meet these goals are shown in **Table 1-2** and **Table 1-3**.

In several larger watersheds (such as Swift Run and Preddy Creek), more severe impairments were located in upstream portions of the watershed. For example, more stringent sediment reductions are needed to restore Blue Run and Stanardsville Run than the larger downstream Swift Run watershed. In these cases, the most downstream impairments were addressed first, and the reductions determined for that overall watershed are presented as an interim scenario in the allocation of each upstream impairment. This method serves two key purposes. It ensures that assistance can be made available to landowners in the larger downstream subwatersheds by recommending a certain amount of reduction to the entire watershed, while also providing an interim target scenario for the more severely impaired upstream subwatersheds. This approach did not impact the wasteload allocations for permitted dischargers in any way.

Table 1-2. Reductions in sediment needed to clean up the impaired waters.

Stream	Percent Reduction in Sediment Loads Needed					
	Crop, Pasture, Hay, and Harvested Forest	**Forest, Trees, Shrubs, and Wetland**	**Developed Pervious and Impervious Areas and Turfgrass**	**Streambank Erosion**	**Permitted Urban Areas (MS4)**	**Other Permitted Sources**
Blue Run	71.5	0	45.0	71.5	n/a	0
Marsh Run	70.0	0	37.5	70.0	n/a	0
Preddy Creek	13.2	0	5.0	13.2	n/a	0
Preddy Creek North Branch	57.3	0	40.4	57.3	n/a	0
Quarter Creek	70.7	0	50.0	70.7	n/a	0
Stanardsville Run	76.8	0	60.0	76.8	n/a	0
Swift Run	18.7	0	5.0	18.7	n/a	0
X-Trib to Flat Branch	50.1	0	50.1	50.1	50.1	0

Table 1-3. Reductions in phosphorus needed to clean up the impaired waters.

Stream	Percent Reduction in Phosphorus Loads Needed					
	Crop, Pasture, Hay, and Harvested Forest	**Forest, Trees, Shrubs, Wetland**	**Developed Pervious and Impervious Areas and Turfgrass**	**Streambank Erosion**	**Permitted Urban Areas (MS4)**	**Other Permitted Sources**
Blue Run	50.0	0	42.5	50.0	n/a	0
Stanardsville Run	67.8	0	67.8	67.8	n/a	0

In order to obtain healthy sediment levels in the impaired streams, significant reductions are needed from several sediment sources. Sediment loads from agricultural sources such as cropland, pasture, and hay need to be reduced by 70% or more in Blue Run, Marsh Run, Quarter Creek, and Stanardsville Run. Sediment reductions from urban and suburban land uses of 50% or greater are called for in Quarter Creek, Stanardsville Run, and X-Trib to Flat Branch, which each have significant urban/suburban land cover area. The total amount of sediment per year that would be entering each of these streams after the recommended reductions are made represent the total maximum daily load of sediment for each stream (**Table 1-4**). If sediment loads are reduced to these amounts, healthy aquatic life should be restored in these streams.

In order to obtain healthy phosphorus levels in Stanardsville Run and Blue Run, significant reductions are also needed. Phosphorus loads from agricultural sources such as cropland, pasture, and hay as well as streambank erosion need to be reduced by 50 and 67.8% in Blue Run and Stanardsville Run, respectively. Reductions of 42.5 and 67.8% to urban and suburban land uses are also called for respectively in Blue Run and Stanardsville Run The total amount of phosphorus per year that would be entering each of these streams after the recommended reductions are made represent the total maximum daily load of phosphorus for each stream (**Table 1-5**). If phosphorus loads are reduced to this amount, healthy aquatic life should be restored in these streams.

Table 1-4. Total Maximum Daily Load of sediment that will meet the water quality standard.

Stream *(Assessment Unit ID)*	**Existing Load (lbs/yr)**	**Allocated Permitted Point Sources (WLA) (lbs/yr)**	**Allocated Nonpoint Sources (LA) (lbs/yr)**	**Margin of Safety (MOS) (lbs/yr)**	**Total Maximum Daily Load (lbs/yr)**	**Overall % Reduction (%)**
Blue Run (VAV-H27R_BLU01A04)	1,370,000	20,750	540,100	62,340	623,000	54.4%
Marsh Run *(VAV-H27R_MAR01A01)*	575,000	5,210	229,200	26,050	260,000	54.7%
Preddy Creek *(VAV-H27R_PRD01A00)*	4,890,000	105,600	3,865,000	441,500	4,410,000	9.8%
Preddy Creek North Branch *(VAV-H27R_PRD02A06)*	1,500,000	47,940	769,300	90,810	908,000	39.3%
Quarter Creek *(VAV-H27R_QTR01A16)*	777,000	11,020	355,400	40,730	407,000	47.6%
Stanardsville Run *(VAV-H27R_STV01A14)*	358,000	6,105	140,100	16,250	163,000	54.5%
Swift Run *(VAV-H27R_SFR01A00)*	4,120,000	89,130	3,134,000	358,300	3,580,000	13.1%
X-Trib to Flat Branch *(VAV-H27R_FTB01A08)*	147,000	27,890	51,710	8,847	88,400	40.0%

Table 1-5. Total Maximum Daily Load of phosphorus that will meet the water quality standard.

Stream *(Assessment Unit ID)*	**Existing Load (lbs/yr)**	**Allocated Permitted Point Sources (WLA) (lbs/yr)**	**Allocated Nonpoint Sources (LA) (lbs/yr)**	**Margin of Safety (lbs/yr)**	**Total Maximum Daily Load (lbs/yr)**	**Overall % Reduction (%)**
Blue Run (VAV-H27R_BLU01A04)	1,260	21.8	758	86.7	867	31.1%
Stanardsville Run *(VAV-H27R_STV01A14)*	353	4.6	156	17.8	178	49.6%

The final sediment and phosphorus average annual loads allocated in the TMDL are presented in **Table 1-6** through **Table 1-15**. GWLF output data, being in monthly increments, is most logically presented as annual aggregates. Any apparent differences in calculated values are due to rounding. Model results were rounded to 4 significant figures, and calculated totals of those results were rounded to 3 significant figures in an effort to reflect the potential decrease in model accuracy that can occur as estimates are summed.

Table 1-6. Annual average sediment TMDL components for X-Trib to Flat Branch.

Impairment	WLA	LA	MOS	TMDL	Existing Load	Percent Reduction
	Sediment Load (lb/yr)					
X-Trib to Flat Branch - TSS (VAV-H27R_FTB01A08)	**27,890**	**51,710**	**8,847**	**88,400**	147,000	40.0%
Construction Permits	*7,980*					
Industrial Stormwater Permits	*1,936*					
MS4 Permits	*16,210*					
Future Growth (2% of TMDL)	*1,769*					

Table 1-7. Annual average sediment TMDL components for Marsh Run.

Impairment	WLA	LA	MOS	TMDL	Existing Load	Percent Reduction
	Sediment Load (lb/yr)					
Marsh Run - TSS (VAV-H27R_MAR01A01)	**5,210**	**229,200**	**26,050**	**260,000**	575,000	54.7%
Future Growth (2% of TMDL)	*5,210*					

Table 1-8. Annual average sediment TMDL components for Preddy Creek.

Impairment	WLA	LA	MOS	TMDL	Existing Load	Percent Reduction
	Sediment Load (lb/yr)					
Preddy Creek - TSS (VAV-H27R_PRD01A00)	**105,600**	**3,865,000**	**441,500**	**4,410,000**	4,890,000	9.8%
Construction Permits	*17,290*					
Future Growth (2% of TMDL)	*88,300*					

Table 1-9. Annual average sediment TMDL components for Preddy Creek North Branch.

Impairment	WLA	LA	MOS	TMDL	Existing Load	Percent Reduction
	Sediment Load (lb/yr)					
Preddy Creek North Branch - TSS (VAV-H27R_PRD02A06)	**47,940**	**769,300**	**90,810**	**908,000**	1,500,000	39.3%
Construction Permits	*29,780*					
Future Growth (2% of TMDL)	*18,160*					

Table 1-10. Annual average sediment TMDL components for Swift Run.

Impairment	WLA	LA	MOS	TMDL	Existing Load	Percent Reduction

	Sediment Load (lb/yr)					
Swift Run - TSS (VAV-H27R_SFR01A00)	**89,130**	**3,134,000**	**358,300**	**3,580,000**	4,120,000	13.1%
Construction Permits	*7,564*					
Industrial Stormwater Permits	*9,900*					
Future Growth (2% of TMDL)	*71,670*					

Table 1-11. Annual average sediment TMDL components for Quarter Creek.

Impairment	**WLA**	**LA**	**MOS**	**TMDL**	**Existing Load**	**Percent Reduction**
	Sediment Load (lb/yr)					
Quarter Creek - TSS (VAV-H27R_QTR01A16)	**11,020**	**355,400**	**40,730**	**407,000**	777,000	47.6%
Construction Permits	*2,878*					
Future Growth (2% of TMDL)	*8,145*					

Table 1-12. Annual average sediment TMDL components for Blue Run.

Impairment	**WLA**	**LA**	**MOS**	**TMDL**	**Existing Load**	**Percent Reduction**
	Sediment Load (lb/yr)					
Blue Run - TSS (VAV-H27R_BLU01A04)	**20,750**	**540,100**	**62,340**	**623,000**	1,370,000	54.4%
Construction Permits	*8,275*					
Future Growth (2% of TMDL)	*12,470*					

Table 1-13. Annual average sediment TMDL components for Stanardsville Run.

Impairment	**WLA**	**LA**	**MOS**	**TMDL**	**Existing Load**	**Percent Reduction**
	Sediment Load (lb/yr)					
Stanardsville Run - TSS (VAV-H27R_STV01A14)	**6,105**	**140,100**	**16,250**	**163,000**	358,000	54.5%
Construction Permits	*2,854*					
Future Growth (2% of TMDL)	*3,251*					

Table 1-14. Annual average phosphorus TMDL components for Blue Run.

Impairment	**WLA**	**LA**	**MOS**	**TMDL**	**Existing Load**	**Percent Reduction**
	Phosphorus Load (lb/yr)					
Blue Run – TP (VAV-H27R_BLU01A04)	**21.8**	**758**	**86.7**	**867**	1,260	31.1%

Construction Permits	*4.5*
Future Growth (2% of TMDL)	*17.3*

Table 1-15. Annual average phosphorus TMDL components for Stanardsville Run.

Impairment	WLA	LA	MOS	TMDL	Existing Load	Percent Reduction
	Phosphorus Load (lb/yr)					
Stanardsville Run – TP (VAV-H27R_SDV01A14)	**4.6**	**156**	**17.8**	**178**	353	49.6%
Construction Permits	*1.1*					
Future Growth (2% of TMDL)	*3.6*					

In 2007, the USEPA released a guidance document for developing maximum daily loads (MDLs) for TMDLs (USEPA, 2007). A methodology detailed therein was used to determine the MDLs for the watersheds. The long-term average (LTA) daily loads, derived by dividing the average annual loads in **Table 1-6** through **Table 1-15** by 365.24, are converted to MDLs using the following equation:

$$MDL = LTA * \exp(Z_p\sigma_y - 0.5\sigma_y^2)$$

where Z_p = pth percentage point of the normal standard deviation, and
$\sigma_y = \mathrm{sqrt}(\ln(CV^2+1))$, with CV = coefficient of variation of the data.

The variable Z_p was set to 1.645 for this TMDL development, representing the 95th percentile. The CV values and final calculated multipliers to convert LTA to MDL values are summarized in **Table 6-11** and **Table 6-12**.

Table 1-16. "LTA to MDL multiplier" components for TSS TMDLs.

Watershed	CV of Average Annual Loads	"LTA to MDL Multiplier"
X-Trib to Flat Branch	0.38	1.72
Marsh Run	0.67	2.27
Preddy Creek	0.60	2.13
Preddy Creek North Branch	0.55	2.05
Swift Run	0.55	2.04
Quarter Creek	0.57	2.08
Blue Run	0.58	2.10

Watershed	CV of Average Annual Loads	"LTA to MDL Multiplier"
Stanardsville Run	0.55	2.04

Table 1-17. "LTA to MDL multiplier" components for TP TMDLs.

Watershed	CV of Average Annual Loads	"LTA to MDL Multiplier"
Blue Run	0.46	1.87
Stanardsville Run	0.41	1.77

The daily WLA was estimated as the annual WLA divided by 365.24. The daily MOS was estimated as 10% of the MDL. Finally, the daily LA was estimated as the MDL minus the daily MOS minus the daily WLA. These results are shown in **Table 1-18**Table 6-13 through **Table 1-27**.

Table 1-18. Maximum 'daily' sediment loads and components for X-Trib to Flat Branch.

Impairment	WLA	LA	MOS	MDL
	Sediment Load (lb/day)			
X-Trib to Flat Branch - TSS (VAV-H27R_FTB01A08)	**76.4**	**298**	**41.6**	**416**
Construction Permits	*21.8*			
Industrial Stormwater Permits	*5.3*			
MS4 Permits	*44.4*			
Future Growth (2% of TMDL)	*4.8*			

Table 1-19. Maximum 'daily' sediment loads and components for Marsh Run.

Impairment	WLA	LA	MOS	MDL
	Sediment Load (lb/day)			
Marsh Run - TSS (VAV-H27R_MAR01A01)	**14.3**	**1,440**	**162.0**	**1,620**
Future Growth (2% of TMDL)	*14.3*			

Table 1-20. Maximum 'daily' sediment loads and components for Preddy Creek.

Impairment	WLA	LA	MOS	MDL
	Sediment Load (lb/day)			
Preddy Creek - TSS (VAV-H27R_PRD01A00)	**289**	**22,900**	**2,570**	**25,700**
Construction Permits	*47.4*			
Future Growth (2% of TMDL)	*242*			

Table 1-21. Maximum 'daily' sediment loads and components for Preddy Creek North Branch.

Impairment	WLA	LA	MOS	MDL
	Sediment Load (lb/day)			
Preddy Creek North Branch - TSS (VAV-H27R_PRD02A06)	**131**	**4,460**	**510**	**5,100**
Construction Permits	*81.6*			
Future Growth (2% of TMDL)	*49.8*			

Table 1-22. Maximum 'daily' sediment loads and components for Swift Run.

Impairment	WLA	LA	MOS	MDL
	Sediment Load (lb/day)			
Swift Run - TSS (VAV-H27R_SFR01A00)	**244**	**17,800**	**2,000**	**20,000**
Construction Permits	*20.7*			
Industrial Stormwater Permits	*27.1*			
Future Growth (2% of TMDL)	*196.0*			

Table 1-23. Maximum 'daily' sediment loads and components for Quarter Creek.

Impairment	WLA	LA	MOS	MDL
	Sediment Load (lb/day)			
Quarter Creek - TSS (VAV-H27R_QTR01A16)	**30.2**	**2,060**	**232**	**2,320**
Construction Permits	*7.9*			
Future Growth (2% of TMDL)	*22.3*			

Table 1-24. Maximum 'daily' sediment loads and components for Blue Run.

Impairment	WLA	LA	MOS	MDL
	Sediment Load (lb/day)			
Blue Run - TSS (VAV-H27R_BLU01A04)	**56.9**	**3,170**	**358**	**3,580**
Construction Permits	*22.7*			
Future Growth (2% of TMDL)	*34.2*			

Table 1-25. Maximum 'daily' sediment loads and components for Stanardsville Run.

Impairment	WLA	LA	MOS	MDL
	Sediment Load (lb/day)			
Stanardsville Run - TSS (VAV-H27R_STV01A14)	**16.7**	**803**	**91**	**910**
Construction Permits	*7.8*			
Future Growth (2% of TMDL)	*8.9*			

Table 1-26. Maximum 'daily' phosphorus loads and components for Blue Run.

Impairment	WLA	LA	MOS	MDL
	Phosphorus Load (lb/day)			
Blue Run - TP (VAV-H27R_BLU01A04)	**0.060**	**3.94**	**0.444**	**4.44**
Construction Permits	*0.012*			
Future Growth (2% of TMDL)	*0.047*			

Table 1-27. Maximum 'daily' phosphorus loads and components for Stanardsville Run.

Impairment	WLA	LA	MOS	MDL
	Phosphorus Load (lb/day)			
Stanardsville Run - TP (VAV-H27R_SDV01A14)	**0.013**	**0.764**	**0.086**	**0.863**
Construction Permits	*0.003*			
Future Growth (2% of TMDL)	*0.010*			

1.6. Public Participation

Throughout this study, VADEQ asked for the help of local residents and knowledgeable stakeholders – those who have a particular interest in or may be affected by the outcome of the project. This public participation keeps people informed about the project, and it provides local input from stakeholders to make sure that information in the study is accurate. While the computer model was being developed, VADEQ held a series of four Technical Advisory Committee (TAC) meetings to get stakeholder input. The TAC included representatives from the Rivanna Conservation Alliance (RCA), Albemarle County, Culpeper Soil and Water Conservation District (SWCD), Thomas Jefferson SWCD, Natural Resource Conservation Service (NRCS), Virginia Department of Transportation (VDOT), Twin Lakes Homeowners Association, Charlottesville Albemarle Airport, and several local landowners. A preliminary TAC meeting was held to discuss the TMDL process, review the impairments and collected water quality data, and plan for the first public meeting to kick off the project. The pre-TAC meeting was attended by 15 people. The first public meeting was attended by 33 residents and the stakeholders listed above. This meeting introduced attendees to the TMDL purpose and process, solicited information about the watershed and pollutant sources, and provided a forum for different local groups such as RCA and SWCDs to set up information booths. The first official TAC meeting (16 attendees) was held to discuss the impairments and review the stressor analysis approach being used to identify pollutants of concern, as well as preliminary results of the stressor analysis, and the land cover data being used in model development. The second TAC meeting (17 attendees) discussed the completed stressor analysis report results and the modeling process, permitted sources in the watershed, and the results of the hydrologic calibration of the watershed model. The third TAC meeting (17 attendees) was held to gather input on the preferred allocation scenarios for the final TMDL. A final public meeting was held on April 17, 2019 to present the draft TMDL document and begin the official public comment period. The final public meeting was attended by 23 residents and other stakeholders.

1.7. Reasonable Assurance

Public participation in the development of the TMDL and implementation plans, follow-up monitoring, permit action plans developed and implemented by MS4 permit holders, other permit compliance, and current implementation progress within the watersheds all combine to provide reasonable assurance that these TMDLs will be implemented and water quality will be restored in the North Fork Rivanna River and tributary watersheds.

1.8. What Happens Next

VADEQ will receive public comment on this report and then submit it to the U.S. Environmental Protection Agency (USEPA) for approval. This report sets the clean-up goals for the North Fork Rivanna River and tributaries, but the next step is a clean-up plan (or Implementation Plan) that lays out how those goals will be reached. Clean-up plans set intermediate goals and describe actions that should be taken to improve water quality in the impaired streams. Some of the potential actions that could be included in an implementation plan for the NF Rivanna River watershed are listed below:

> **Frequently Asked Question:**
>
> *How will the TMDL be implemented?* For point sources, TMDL reductions will be implemented through discharge permits. For nonpoint sources, TMDL reductions will be implemented through best management practices (BMPs). Landowners will be asked to voluntarily participate in state and federal programs that help defer the cost of BMP installation.

- Fence out cattle from streams and provide alternative water sources
- Implement conservation tillage practices on cropland
- Conduct stream bank restoration projects in areas where banks are actively eroding
- Leave a band of 35 – 100 ft along the stream natural so that it buffers or filters out sediment from farm or residential land (a riparian buffer)
- Expanded street sweeping programs in urban areas
- Reduce runoff by increasing green spaces and reducing hardened spaces (asphalt or concrete)

These and other actions that could be included in a clean-up plan are identified in the planning process along with associated costs and the extent of each practice needed. The clean-up plan also identifies potential sources of money to help in the clean-up efforts. Most of the money utilized to implement actions in the watersheds to date has been in the form of cost-share programs, which share the cost of improvements with the landowner. Additional funds for urban stormwater practices have been made available through various grants, including a grant from the National Fish and Wildlife Foundation. Please be aware that the state or federal government will not fix the problems with the North Fork Rivanna River and tributaries. It is primarily the responsibility of individual landowners and local governments to take the actions necessary to improve these streams. The role of state agencies is to help with developing the plan and find money to support implementation, but actually making the improvements is up to those that live in the watershed. By increasing education and awareness of the problem, and by working together to each do our part, we can make the changes necessary to improve the streams.

VADEQ and RCA will continue to sample aquatic life in these streams and monitor the progress of clean-up. This sampling will let us know when the clean-up has reached certain milestones listed in the plan. To begin moving towards these clean-up goals, VADEQ recommends that concerned citizens come together and begin working with local governments, civic groups, soil and water conservation districts, and local health districts to increase education and awareness of the problem and promote those activities and programs that improve stream health.

This page is intentionally left blank

Attachment II – Amended Water Quality Management Planning Regulation proposed for Board Adoption

9 VAC 25-720-50.A	**Potomac-Shenandoah River Basin**
9 VAC 25-720-60.A	**James River Basin**

9VAC25-720-50. Potomac – Shenandoah River Basin.

A. Total Maximum Daily Load (TMDLs).

TMDL #	Stream Name	TMDL Title	City/County	WBID	Pollutant	WLA[1]	Units
219.	North Fork Catoctin Creek	A TMDL and Watershed Management Plan to Address Sediment in North Fork Catoctin Creek Located in Loudoun County, Virginia	Loudoun	A02R	Sediment	99.1	tons/year

[1]The total WLA can be increased prior to modification provided that DEQ track these changes for bacteria TMDLs where the permit is consistent with water quality standards for bacteria.

[2]There were no point source dischargers in the modeled TMDL area.

9VAC25-720-60. James River Basin.

A. Total Maximum Daily Load (TMDLs).

TMDL #	Stream Name	TMDL Title	City/County	WBID	Pollutant	WLA[1]	Units
173.	Blue Run	Benthic TMDL Development for the North Fork Rivanna River Watershed and Tributaries Located in Albemarle, Greene, and Orange Counties	Albemarle, Greene, Orange	H27R	Sediment	20,750	lbs/year
174.	Marsh Run	Benthic TMDL Development for the North Fork Rivanna River Watershed and Tributaries Located in Albemarle, Greene, and Orange Counties	Albemarle, Greene, Orange	H27R	Sediment	5,210	lbs/year
175.	Preddy Creek	Benthic TMDL Development for the North Fork Rivanna River Watershed and Tributaries Located in Albemarle, Greene, and Orange Counties	Albemarle, Greene, Orange	H27R	Sediment	105,600	lbs/year
176.	Preddy Creek North Branch	Benthic TMDL Development for the North Fork Rivanna River Watershed and Tributaries Located in Albemarle, Greene, and Orange Counties	Albemarle, Greene, Orange	H27R	Sediment	47,940	lbs/year
177.	Quarter Creek	Benthic TMDL Development for the North Fork Rivanna River Watershed and Tributaries Located in Albemarle, Greene, and Orange Counties	Albemarle, Greene, Orange	H27R	Sediment	11,020	lbs/year
178.	Standardsville Run	Benthic TMDL Development for the North Fork Rivanna River Watershed and Tributaries Located in Albemarle, Greene, and Orange Counties	Albemarle, Greene, Orange	H27R	Sediment	6,105	lbs/year
179.	Swift Run	Benthic TMDL Development for the North Fork Rivanna River Watershed and Tributaries Located in Albemarle, Greene, and Orange Counties	Albemarle, Greene, Orange	H27R	Sediment	89,130	lbs/year
180.	Unnamed Tributary to Flat Branch	Benthic TMDL Development for the North Fork Rivanna River Watershed and Tributaries Located in Albemarle, Greene, and Orange Counties	Albemarle, Greene, Orange	H27R	Sediment	27,890	lbs/year
181.	Blue Run	Benthic TMDL Development for the North Fork Rivanna River Watershed and Tributaries Located in Albemarle, Greene, and Orange Counties	Albemarle, Greene, Orange	H27R	Total Phosphorus	21.8	lbs/year
182.	Standardsville Run	Benthic TMDL Development for the North Fork Rivanna River Watershed and Tributaries Located in Albemarle, Greene, and Orange Counties	Albemarle, Greene, Orange	H27R	Total Phosphorus	4.6	lbs/year

[1]The total WLA can be increased prior to modification provided that DEQ tracks these changes for bacteria TMDLs where the permit is consistent with water quality standards for bacteria.

[2]GS means growing season.

This page is intentionally left blank

Attachment III – Virginia Regulatory Town Hall

Virginia
Regulatory
Town Hall

townhall.virginia.gov

Exempt Action Final Regulation Agency Background Document

Agency name	State Water Control Board
Virginia Administrative Code (VAC) citation	9 VAC 25-720
Regulation title	Water Quality Management Planning Regulation
Action title	Amendment to add eleven new TMDL waste load allocations in the Potomac-Shenandoah River Basin (9VAC25-720-50.A) and James River Basin (9VAC25-720-60.A).
Final agency action date	XXXX XX, XX
Document preparation date	February 18, 2020

When a regulatory action is exempt from executive branch review pursuant to § 2.2-4002 or § 2.2-4006 of the Virginia Administrative Process Act (APA), the agency is encouraged to provide information to the public on the Regulatory Town Hall using this form.

Note: While posting this form on the Town Hall is optional, the agency must comply with requirements of the Virginia Register Act, Executive Orders 14 (2010) and 58 (1999), and the *Virginia Register Form, Style, and Procedure Manual.*

Summary

Please provide a brief summary of all regulatory changes, including the rationale behind such changes. Alert the reader to all substantive matters or changes. If applicable, generally describe the existing regulation.

The amendments to the state's Water Quality Management Planning Regulation (9 VAC 25-720) include adding one new TMDL waste load allocation in the Potomac-Shenandoah River Basin (9VAC25-720-50.A) and ten new TMDL waste load allocations in the James River Basin (9VAC25-720-60.A).

The TMDLs were developed in accordance with Federal Regulations (40 CFR § 130.7) and are exempt from the provisions of Article II of the Virginia Administrative Process Act. The TMDL reports were subject to the TMDL public participation process and the waste load allocations are adopted as part of 9 VAC 25-720 in accordance with Virginia's "Public Participation Procedures for Water Quality Management Planning".

Statement of final agency action

Please provide a statement of the final action taken by the agency including (1) the date the action was taken, (2) the name of the agency taking the action, and (3) the title of the regulation.

At its meeting on XXXX XX, XXXX the State Water Control Board adopted the amendments to the Water Quality Management Planning Regulation (9 VAC 25-720 et seq.).

Public comment

Please summarize all comments received during the public comment period following the publication of the proposed stage, and provide the agency response. If no comment was received, please so indicate.

Commenter	Comment	Agency response

The comment period for the regulation amendment with the TMDL waste load allocations extended from January 20 – February 19, 2020. No comments were received.

All changes made in this regulatory action

Please detail all changes that are being proposed and the consequences of the proposed changes.
Detail new provisions and/or all changes to existing sections.

Current section number	Proposed new section number, if applicable	Current requirement	Proposed change and rationale
50.A		Potomac – Shenandoah River Basin	Adopting one new TMDL waste load allocation in the Potomac-Shenandoah River Basin.
60.A		James River Basin	Adopting ten new TMDL waste load allocations in the James River Basin.

Family impact

Assess the impact of this regulatory action on the institution of the family and family stability.

The amendment of the Water Quality Management Planning Regulation is for the protection of public health, safety, and welfare and the Board does not anticipate any direct impact on the institution of the family and family stability.

Acronyms and Definitions

Allocation: That portion of a receiving water's loading capacity that is attributed to one of its existing or future pollution sources (nonpoint or point) or to natural background sources.

Allocation Scenario: A proposed series of point and nonpoint source allocations (loadings from different sources), which are being considered to meet a water quality planning goal.

Background levels: Levels representing the chemical, physical, and biological conditions that would result from natural geomorphological processes such as weathering and dissolution.

Best Management Practices (BMP): Methods, measures, or practices that are determined to be reasonable and cost- effective means for a land owner to meet certain, generally nonpoint source, pollution control needs. BMPs include structural and nonstructural controls and operation and maintenance procedures.

Calibration: The process of adjusting model parameters within physically defensible ranges until the resulting predictions give a best possible good fit to observed data.

Direct nonpoint sources: Sources of pollution that are defined statutorily (by law) as nonpoint sources that are represented in the model as point source loadings due to limitations of the model. Examples include: direct deposits of fecal material to streams from livestock and wildlife.

Failing septic system: Septic systems in which drain fields have failed such that effluent (wastewater) that is supposed to percolate into the soil, now rises to the surface and ponds on the surface where it can flow over the soil surface to streams or contribute pollutants to the surface where they can be lost during storm runoff events.

HSPF (Hydrological Simulation Program-Fortran): A computer-based model that calculates runoff, sediment yield, and fate and transport of various pollutants to the stream. The model was developed under the direction of the U.S. Environmental Protection Agency (EPA).

Hydrology: The study of the distribution, properties, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.

Instantaneous or Single Sample criterion: The instantaneous criterion or instantaneous water quality standard is the value of the water quality standard that should not be exceeded at any time. For example, the Virginia instantaneous water quality standard for *E. coli* is 235 cfu/100 mL. If this value is exceeded at any time, the water body is in violation of the state water quality standard.

Load allocation (LA): The portion of a receiving water's loading capacity that is attributed either to one of its existing or future nonpoint sources of pollution or to natural background.

Margin of Safety (MOS): A required component of the TMDL that accounts for the uncertainty about the relationship between the pollutant loads and the quality of the receiving waterbody. The MOS is normally incorporated into the conservative assumptions used to develop TMDLs (generally within the calculations or models).

Model: Mathematical representation of hydrologic and water quality processes. Effects of land use, slope, soil characteristics, and management practices are included.

Nonpoint source: Pollution that is not released through pipes but rather originates from multiple sources over a relatively large area. Nonpoint sources can be divided into source activities related to either land or water use including failing septic tanks, improper animal-keeping practices, forest practices, and urban and rural runoff.

Pathogen: Disease-causing agent, especially microorganisms such as bacteria, protozoa, and viruses.

Point source: Pollutant loads discharged at a specific location from pipes, outfalls, and conveyance channels from either municipal wastewater treatment plants or industrial waste treatment facilities. Point sources can also include pollutant loads contributed by tributaries to the main receiving water stream or river.

Pollution: Generally, the presence of matter or energy whose nature, location, or quantity produces undesired environmental effects. Under the Clean Water Act for example, the term is defined as the man-made or man-induced alteration of the physical, biological, chemical, and radiological integrity of water.

Reach: Segment of a stream or river.

Runoff: That part of rainfall or snowmelt that runs off the land into streams or other surface water. It can carry pollutants from the air and land into receiving waters.

Septic system: An on-site system designed to treat and dispose of domestic sewage. A typical septic system consists of a tank that receives liquid and solid wastes from a residence or business and a drainfield or subsurface absorption system consisting of a series of tile or percolation lines for disposal of the liquid effluent. Solids (sludge) that remain after decomposition by bacteria in the tank must be pumped out periodically.

Simulation: The use of mathematical models to approximate the observed behavior of a natural water system in response to a specific known set of input and forcing conditions. Models that have been validated, or verified, are then used to predict the response of a natural water system to changes in the input or forcing conditions.

Straight pipe: Delivers wastewater directly from a building, e.g., house, milking parlor, to a stream, pond, lake, or river.

Total Maximum Daily Load (TMDL): The sum of the individual wasteload allocations (WLA's) for point sources, load allocations (LA's) for nonpoint sources and natural background, plus a margin of safety (MOS). TMDLs can be expressed in terms of mass per time, toxicity, or other appropriate measures that relate to a state's water quality standard.

Urban Runoff: Surface runoff originating from an urban drainage area including streets, parking lots, and rooftops.

Validation (of a model): Process of determining how well the mathematical model's computer representation describes the actual behavior of the physical process under investigation. This follows the calibration of the model and ensures that the calibrated values adequately represent the watershed.

Wasteload allocation (WLA): The portion of a receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. WLAs constitute a type of water quality-based effluent limitation.

Water quality standard: Law or regulation that consists of the beneficial designated use or uses of a water body, the numeric and narrative water quality criteria that are necessary to protect the use or uses of that particular water body, and an anti-degradation statement.

Watershed: A drainage area or basin in which all land and water areas drain or flow toward a central collector such as a stream, river, or lake at a lower elevation.

For more definitions, see the Virginia Cooperative Extension publications available online:

Glossary of Water-Related Terms. Publication 442-758. http://www.ext.vt.edu/pubs/bse/442-758/442-758.html

and

TMDLs (Total Maximum Daily Loads) - Terms and Definitions. Publication 442-550. http://www.ext.vt.edu/pubs/bse/442-550/442-550.html